

WASHBURN CROSBY ELEVATOR
(Frontier Elevator)
(General Mills Elevator)
54 S. Michigan Avenue
Buffalo
Erie County
New York

HAER No. NY-244

HAER
NY
15-BUF
48-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA
PHOTOGRAPHS

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HISTORIC AMERICAN ENGINEERING RECORD

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Location: 54 S. Michigan Ave., Buffalo, Erie County, NY

Date: Elevator "B": Building permit application January 23, 1909; approved January 26, 1909
Elevator "C1": Building permit application March 23, 1909; approved April 14, 1909; completed November, 1909
Elevator "C2": Building permit application filed March 22, 1913; approved April 4, 1913
Elevator "C3": Building permit application July 3, 1925; approved August 3, 1925

Designer: Elevators "B," "C1," "C2": James Stewart & Co.
Elevator "C3": unknown

Builder: Elevators "B," "C1," "C2": James Stewart & Co.
Elevator "C3": unknown

Status: Operational

Significance: The grain elevators of Buffalo comprise the most outstanding collection of extant grain elevators in the United States, and collectively represent the variety of construction materials, building forms, and technological innovations that revolutionized the handling of grain in this country.

Project Information: The documentation of Buffalo's grain elevators was prepared by the Historic American Engineering Record (HAER), National Park Service, in 1990 and 1991. The project was co-sponsored by the Industrial Heritage Committee, Inc., of Buffalo, Lorraine Pierro, President, with the cooperation of The Pillsbury Company, Mark Norton, Plant Manager, Walter Dutka, Senior Mechanical Engineer, and with the valuable assistance of Henry Baxter, Henry Wollenberg, and Jerry Malloy. The HAER documentation was prepared under the supervision of Robert Kapsch, Chief, HABS/HAER, and Eric DeLony, Chief and Principal Architect, HAER. The project was managed by Robbyn Jackson, Architect, HAER, and the team consisted of: Craig Strong, Supervising Architect; Todd Croteau, Christopher Payne, Patricia Reese, architects; Thomas Leary,

Supervising Historian; John Healey, and Elizabeth Sholes, historians. Large-format photography was done by Jet Lowe, HAER photographer.

Historians: Thomas E. Leary, John R. Healey, Elizabeth C. Sholes, 1990-1991

This is one in a series of HAER reports for the Buffalo Grain Elevator Project. HAER No. NY-239, "Buffalo Grain Elevators," contains an overview history of the elevators. The following elevators have separate reports:

NY-240 Great Northern Elevator
NY-241 Standard Elevator
NY-242 Wollenberg Grain & Seed Elevator
NY-243 Concrete-Central Elevator
NY-244 Washburn Crosby Elevator
NY-245 Connecting Terminal Elevator
NY-246 Spencer Kellogg Elevator
NY-247 Cooperative Grange League Federation
NY-248 Electric Elevator
NY-249 American Elevator
NY-250 Perot Elevator
NY-251 Lake & Rail Elevator
NY-252 Marine "A" Elevator
NY-253 Superior Elevator
NY-254 Saskatchewan Cooperative Elevator
NY-255 Allied Elevator
NY-256 Urban Elevator
NY-257 H-O Oats Elevator
NY-258 Kreiner Malting Elevator
NY-259 Meyer Malting Elevator
NY-260 Eastern States Elevator

In addition, the Appendix of HAER No. NY-239 contains brief notations on the following elevators:

Buffalo Cereal Elevator
Cloverleaf Milling Co. Elevator
Dakota Elevator
Dellwood Elevator
Great Eastern Elevator
Iron Elevator
John Kam Malting Elevator
Monarch Elevator
Pratt Foods Elevator
Ralston Purina Elevator
Riverside Malting Elevator

The large General Mills elevating and milling complex at 54 South Michigan Street began as a small Buffalo-owned elevator company in 1886. Frontier Elevator was incorporated by six local businessmen June 23, 1886 for the purpose of elevating, storing, and transferring grain and for building and managing elevators. The capital for the company was authorized at \$400,000 with operations to be managed by the six incorporators and an additional director.¹

The original founders and operators included John Davidson, a ship owner, Edward N. Cook and Gustave Fleischman, both partners in E.N.C. & G. Fleischman-Distillers, and John A. Campbell, Stephen Ratcliffe Sr. and Stephen Ratcliffe Jr., all grain merchants in the firm of Campbell & Ratcliffe. Another director, John C. Graves, joined the group and became president of the new Frontier Elevator enterprise. By February, 1887, the seven men had paid in the entire pledged capital of \$400,000. The company's apparent affluence attracted other investors, and a new group of directors was on the Board in the second year. Alfred P. Wright, a grain commission merchant, and Joel H. Prescott, Jr., secretary and treasurer for Frontier in 1888 and 1894 respectively, were also involved with Pennsylvania Distilling Company. Leonard Dodge was the proprietor of Dodge Roller Flour Mills in Buffalo and most likely an important customer for Frontier.²

In 1888 Frontier expanded its holdings by purchasing a parcel of land on Hatch Slip in outer lot forty-two. The slip gave the elevator greater unloading access but cost the company approximately \$50,000 payable in a one-year mortgage at 5 percent interest. In 1890 Frontier still had a large portion of the mortgage outstanding, an indication that not all was proceeding well financially. Over the next eight years, the company reduced the mortgage by about \$5,000 per year with a final balloon payment of \$19,000 in the final year, 1897-1898. Since the elevator had great potential, the mortgage holder, Erie Savings Bank, was willing to modify its original payment schedule to keep Frontier afloat. At the completion of construction, the Frontier had a storage capacity of 4.75 million bushels and was the largest of Buffalo's twenty-one elevators in operation at the time. Even the most avid financier would be hesitant to foreclose on an operation of that magnitude.³

In 1903 a new flour milling company came to Buffalo from Minneapolis. The Washburn Crosby Company filed its building permit April 18 of that year and was expected to finish construction on its proposed brick flour mill in October. The mill was built next to the Frontier on the site of the old Dakota Mill that had burned some years earlier. The new Washburn Crosby

mill was endowed with two "immense tile tanks twenty feet in diameter and eighty feet high," but they were only storage tanks and lacked marine legs through which grain could be unloaded into the tanks. Washburn Crosby thus established a working relationship with the Frontier which had a marine tower. The Frontier received grain from the lake ships then transferred agreed-on amounts of wheat via conveyor from its elevator's tanks to Washburn Crosby's nearby twin storage tanks.⁴

Washburn Crosby was formally established in Minneapolis, Minnesota, in July of 1889, as a partnership between two separate firms owned by the Washburns and the Crosbys, prominent northwestern milling families whose enterprises had begun as early as 1866. In 1879 Cadwallader Washburn had adopted the European all-roller, graduated-reduction milling methods to replace grindstones. Roller milling produced much finer, softer flours even from the hard wheats of the upper Great Plains, and Washburn's reputation for flour quality established the company as an important national milling concern. After merging, the larger company's success in Minnesota prompted it to look eastward in order to establish milling operations closer to eastern markets. Simultaneously, the Interstate Commerce Commission yielded to pressure from politicians and business interests at the eastern end of the Great Lakes to allow favorable water and water and rail transportation rates that enhanced the desirability of shipping raw wheat via lakers to Buffalo. The unity of interests between northwestern millers and east Great Lakes elevators was thereby established.⁵

A second lure to milling interests was the establishment of "milling-in-bond." Under this trade agreement, foreign (e.g., Canadian) wheat could be imported into the United States and milled at American mills. The tariff duties were then remitted to the shipper when the flour was exported for sale outside the U.S. Since rapid turnover between milling and export assured a quicker rebate of duties, Buffalo was a logical milling center for exporters and domestic millers.

Washburn Crosby was among the companies seeking turnover for exports. It had already established business operations in Buffalo in 1893 under the guidance of Frank F. Henry, a former assistant manager of the Lehigh Valley Transportation Company. In 1899 Washburn Crosby leased a warehouse on Fillmore Avenue at Clinton Street. This facility represented the company's escalation of efforts to gain access to the eastern domestic markets as well as the ports of the Atlantic seaboard. With a 60,000-bushel capacity, it was one of Buffalo's largest storage facilities. However, by 1902 Washburn Crosby had ambitions that far surpassed what the warehouse could supply, and the company

selected the old Dakota site for a mill.

Henry stated that there were many reasons for the company to build this facility.

For a number of years we've been sending from 1,000,000 to 1,500,000 barrels of flour to Buffalo every year for distribution. But wheat has always been brought down the lakes at a cheaper rate than flour and always will be. Therefore the company determined to save this extra expense...and erect a mill in Buffalo to supply our Eastern trade.... Owing to these considerations of transportation and distribution there is no doubt in my mind that Buffalo will one day become an important milling center...

That prophecy proved accurate, and Washburn Crosby embarked on a long period of growth and expansion.⁶

For four years after the mill was established, the cooperative relationship between Frontier and Washburn Crosby continued with respect to unloading and transferring grain. In addition, the company purchased another nearby elevator, the "new" Dakota built in 1902 by the Lehigh Valley Railroad, but the main elevator in the new complex remained the Frontier. In 1907 the rapidly expanding Washburn Crosby Company determined that, to protect itself and its own holdings, it was necessary to buy out the smaller local company and absorb Frontier into the Minneapolis-based operations. The Frontier became a Washburn Crosby subsidiary in October of that year and its name was changed to Frontier Elevator and Mill Company.⁷

Having consolidated its Buffalo operations, in 1908-1909 Washburn Crosby built its second "B" Mill with a new "B" Elevator. Along with the existing "A" Mill, this addition gave the company a combined capacity of 11,000 barrels per day or 15 million barrels per year of flour. Unlike the steam-powered "A" Mill, the new milling operations were electrically driven. In conjunction with the new mill, Washburn Crosby built steel and concrete fireproof wheat storage bins 33" in diameter and 107" high. The first phase of a new Frontier elevator, Elevator "C", was completed in 1909. It also was a fireproof concrete structure.⁸

By 1913 the Buffalo facility was the fourth largest elevating and milling complex in the country, surpassed only by three Minneapolis operations: the Washburn Crosby, Pillsbury, and Northwest Consolidated Milling. The vitality of the Buffalo business was illustrated by the increase of capital authorization

for the Frontier subsidiary to \$500,000. The stockholders authorizing the local expansion included James Bell, President of Washburn Crosby, John Washburn, a member of the family and of the Board, and Buffalo manger F. F. Henry, now a Washburn Crosby officer. No local Buffalo officers or directors remained with either the parent operation or the Buffalo subsidiary.⁹

Europe's entry into World War I and the immediate prelude to U.S. involvement in the conflict made food supplies of central concern to the nation's economy. The boom in grain elevating and milling lasted well into the early 1920s, at which point the war- and reconstruction-driven demand faltered. Despite the increased commercial use of 40 percent of the product in bakeries and in retail sales through groceries, there was nationwide overproduction. Profits declined throughout the grain processing industry, and the overcapacity was only partially ameliorated by the closing of obsolete facilities.

The instability within the industry gave rise to a large merger movement not unlike that which had occurred at the end of the previous century. Washburn Crosby, one of the largest and most stable firms, organized several national milling firms under its own control. The company acquired milling operations and added milling firms such as Royal Milling, Red Star Milling, the Sperry chain, some of the Kell companies in Texas and Oklahoma, and the El Reno operations in Oklahoma. The result was a loose confederation of internally competitive businesses which, in June, 1928, was incorporated in Delaware. It was not until 1937, however, that each operation was formally absorbed into the parent corporation.¹⁰

In the midst of the merger mania, Washburn Crosby was still improving its Buffalo operations. In 1925 the company erected yet another concrete grain elevator through its Frontier subsidiary, and the vitality of the complex was assured as improvements and additions were made throughout the 1920s and 1930s. One casualty of the physical expansion and corporate absorption was Frontier Elevator & Mill Company. In March of 1929, the subsidiary ceased to exist when Frontier executives signed a certificate of dissolution and in May filed a petition with the state of New York to terminate Frontier's corporate existence.¹¹

In 1938 the Buffalo operations of Washburn Crosby, as it was still locally known, announced a massive expansion program for a large new addition that would add both milling and warehouse facilities. The company planned to spend \$2 million to place the new buildings on canal frontage. The investment was well worth the cost. Since 1930 Buffalo had surpassed Minneapolis as the

flour milling center of the nation, and the additions would make the local plant the largest of its kind in the world. The expansion would also diversify the company's product line since the new mill was not designated for flour, but for breakfast cereals and packaged goods. The warehouse would increase flour storage capacity as well. The plans were filed in August of 1939 and work proceeded from there.¹²

In 1941, when the new additions were fully operational, the Buffalo plant produced only four products. By the next decade, however, it turned out thirty separate lines including six cereals, eight cake mixes, various cookie mixes, and other items. Much of the Cheerios consumed in America came from the Buffalo plant, as did a large portion of Gold Medal flour. By 1959 the mill annually used all the wheat that could be raised on 1.25 million acres of land or 90,000 bushels per day, some 20 million bushels per year. The mill turned out 1.5 million packages of special products every day and loaded 100 railroad cars that distributed the mill's output to the American consumer. By 1959 there were extensive expansion plans underway to construct yet another flour mill on the south side of Michigan Avenue. The Flour milling "C" Mill was to be 135' x 126' and 55' deep, a significant addition to the plant's capacity.¹³

The General Mills Company of the post-war era differed markedly from the Frontier Elevator of old. Although General Mills was in part family controlled, its board of directors now bore the stamp of national status. The Chairman of the Board in 1961 was former Buffalonian, Gerald S. Kennedy. He had spent nineteen years at the Buffalo mill before moving to the corporate headquarters in Minneapolis. The remainder of both inside company directors and outside representatives from influential corporations came from within the echelons of American's leading industrial, retail, and financial businesses. By the 1960s even Minneapolis influence on the board, outside of the family representatives, was virtually nonexistent. The direction of the company reflected its status within the national business community.¹⁴

The company's corporate growth strategy, adopted after World War II, brought it to national prominence. In the early years, unlike pure grain traders such as Continental and Cargill, General Mills never functioned as a merchant trader selling bulk commodities on the wholesale market. Instead, it created its own retail and finished goods trade to which its elevators and mills were totally dedicated.

After World War II, however, General Mills' corporate orientation began to change. The company continued to serve a

consumer market, but it began to substantially diversify product lines. Much of the influence behind this decision came from Chairman James Ford Bell who was company president during the formation of General Mills proper. He hired former Air Force Commander Edwin Rawlings, who closed down nearly half of the company's old mills and directed the company's capital into new fields. General Mills began absorbing other companies that made snacks or prepared foods such as Mortons, a peanut company, and Gorton's fish.

By 1964 General Mills was diversifying into pharmaceuticals, creative toys for children, specialty chemical products, thread, and restaurants. In Buffalo, the company also owned O-Cell-O, a manufacturer of synthetic sponges, and Kittinger Furniture, a skilled craft manufacturer of fine office and residential furniture including the noted Williamsburg Reproduction line.¹⁵ During the heyday of diversification, some of the company's milling capacity was scaled back. After Rawlings closed the older plants, the company began reducing individual mill output. Buffalo alone was cut from 39,200 cwt to 30,900 cwt.

In 1961 before the massive shift in corporate investment plants, the Western New York plant was selected to introduce an innovative milling technology known as "Bellera" milling (named for former Chairman Bell by his son James who was the current corporate president) or the "Airsun" process. The vastly simplified technology was as revolutionary within the industry as Washburn's first roller mill had been in its time. By cutting the miles of roller lines and amount of handling needed to produce fine soft flours, it eliminated many of the steps, and thereby many of the workers, that had been a staple of the milling industry for over six decades. The new technology also used about 28 percent less space in a "stacked" compact sequence. The mill was not designed to increase capacity so much as to improve efficiency.

The new "C" Mill was to have replaced the older "A" Mill, Washburn Crosby's first. Despite the quest for improved handling, this new mill did not have its own unloading grain elevator any more than had Mill "A," and relied on the time-honored method of conveying wheat from the other elevators to the "C" complex. The new mill was officially opened March 8, 1961.¹⁶ By September, 1963, rather than abandoning the old "A" Mill, General Mills had elected to revamp the old facility. It was overhauled to produce the company's newest product, the self-sifting "Wondra" flour which originally had been manufactured only in the company's Kansas City plant.

Mill "A" modernization efforts included partial dismantling

of a portion of the mill, but concentrated primarily on interior redesign to improve its fireproof standards, cleanliness, and product flow layout. As with Mill "C", at no point did the expanded capacity of Mill "A", an additional 40,000 square feet, appear to require additional elevating capacity. Even after the opening of Mill "C" and expansion of Mill "A", the existing elevator operations appeared to be adequate.¹⁷

At the end of 1963, the Buffalo mill was the epitome of efficient production; it offered improved capacity without the need for costly expansion in auxiliary operations, coupled with a reduction in the labor force and the expansion of new market lines such as the "Wondra" flour. But by 1964 it was not of sufficient interest to the company. Less than two years after the revamping of Mill "A", General Mills announced huge cuts in the Buffalo operations, even as the company was vigorously pursuing its entry into non-food ventures. The company ordered the shutdown of the "B" milling unit which reduced the plant's operating capacity by 62 percent. Three hundred of the 1,300 employees were affected by the closing of the mill and the sale of its equipment.

In addition, the 1 million bushel steel-bin Dakota Elevator was ordered closed, reducing storage capacity by 20 percent. Only the flour milling operations were affected by these closings; cereal and package foods were left intact. Despite the shutdown of such key facilities, the Buffalo plant remained the largest of all General Mills operations with the Bellera Mill the second largest in the company. The parent corporation claimed low profit margins coupled with capital demands for "B" Mill modernization made retention of the facilities untenable. The Frontier Elevator, however, was to be kept in operation.¹⁸

The reduction in national flour production capacity by 55 percent disproportionately affected Buffalo. The company claimed that labor costs and state and local taxes were not factors in its decisions. Instead the policies which led to Buffalo plant reductions were based on the rates of return on flour processing alone and on a soft sales market. The company added that it would rebuild new packing facilities and would consider selling the Dakota Elevator. However, the 1965 demolition of the Dakota was followed by the destruction of "A" and "B" mills in 1968 and 1969 respectively. With the abrupt cessation of flour milling in those two mills within a decade, General Mills' production fell behind that of its rival, Pillsbury. All flour production was left to the Bellera Mill with product emphasis shifting from milling to food and cereal lines.¹⁹

At first the new strategy appeared to work well for General

Mills. The next two decades were enormously active and profitable, with the company expanding not only into a wide variety of operations but also into numerous foreign markets. By 1985, however, the company was saddled with enormous debt and a shrinking consumer market as the economy slowed and discretionary incomes dwindled. Beginning in 1985, General Mills either sold or spun off dozens of its non-food ventures to generate cash for the repayment of debts and to provide capital for upkeep of its basic product line equipment.²⁰

Although two of General Mills' subsidiary lines, O-Cell-O Sponges and Kittinger Furniture, were casualties of the company's divestiture program in the last three years, the core operations at the flour and package food plant remain intact. Much of the plant's original elevating capacity is still operating and proves a cost-effective amortization of capital over a ninety-year period. The plant remains a vital manufacturing force in Western New York and a leading operation within the General Mills Corporation.

MATERIALS HANDLING: HISTORY AND DESCRIPTION

Due to an unusual combination of site conditions and functional requirements, the General Mills complex possesses the most intricate and atypical materials handling arrangements of any waterfront facility in Buffalo. To summarize the overall situation, existing conditions represent cumulative solutions to a series of elevating and conveying problems encountered in linking various processing plants and storage areas. The accretion of processing plants has included the Washburn Crosby "A" (1903) and "B" (1909) Flour Mills, the General Mills Packaged Foods Division (1941), and the Bellera Flour Mill, known as Mill "C" (1961).²¹ Grain storage areas pertinent to this study consist of the tile bins associated with Mill "A", the reinforced concrete tanks associated with Mill "B", and the Frontier Elevator, constructed in three phases (1909, 1913, 1925) and also known as "C1", "C2" and "C3."

The storage units receive grain by water and rail through procedures comparable to the classic waterfront transfer elevators of Buffalo's past. However, since most of the receipts are eventually processed on site, shipping facilities for grain are vestigial, though a large volume of flour and cereal does leave the site on a regular basis.

At Frontier and its adjuncts, in terms of mechanical engineering, there is less of a premium placed on rapid intermodal transfer--the purpose of houses such as Concrete-

Central, Superior, Marine "A" and the Saskatchewan. Rather, the logic of elevator operations has focused on moving grain around an increasingly dense accumulation of bins crammed onto an ever more congested site. Kelly Island, the local name given the peninsula between the Buffalo River and the city ship Canal, is quite narrow, and the original Washburn Crosby property was closely hedged in by other elevators, industries and docks. Site conditions precluded extensive construction of the long, narrow rows of parallel bins usually associated with concrete elevators. The footprint of Frontier evolved as an irregular polygon more square than rectangular, a shape that required installation of transverse conveyors and multiple overhead galleries to reach all portions of storage.

Evolution over time has also wrought more changes at General Mills than at other waterfront sites. Expansion has created new transfer requirements, and demolition severed older links, principally in the case of the steel-tank Dakota Elevator (1902) that once stood on the city ship canal north of Frontier.²² Occasional gaps in available data obscure some stages of development, rendering portions of materials handling history even more opaque.

Neither the Washburn Crosby "A" (tile) and "B" (concrete) elevators, situated at the west ends of the flour mills they served, nor the "C1" phase of the new Frontier Elevator, possessed any equipment for unloading boats. During most of the first decade of operations, marine receipts were handled through an older Frontier Elevator, a wooden house of 650,000-bushel storage capacity and undetermined marine elevating capacity situated to the north on Hatch Slip.

When rail shipments to Mill "A" proved inadequate to supply processing requirements, a bridge connecting Frontier and the car pit at Mill "A" was constructed. A 30" wide belt was installed to transfer instore grain which was weighed in a 1,000-bushel scale at "A" Mill. Subsequently, to reach Elevator "C1" grain received at the old Frontier was carried through a tunnel conveyor. As built in 1909, "C1" consisted of a series of bins aligned in long rows perpendicular to the city ship canal. A prominent workhouse occupied the west end of the new structure facing the canal. Marine receipts conveyed from the original Frontier were elevated in the "C1" workhouse via a pair of lofter legs. A single 150 hp at 480 rpm motor, located on the scale floor of the headhouse, powered both legs through a rope drive transmission system; the same motor also drove cleaning machinery and the bin floor conveyors through rope-and-countershaft arrangements. The lofters discharged into a single set of weighing and distributing apparatus, comprising a 200-bushel upper garner, a 100-bushel scale, and a 450-bushel lower garner.

Grain could be channeled by gravity from the lower garner to a No. 34 Prinz cleaner or to a pair of 36" storage belts running longitudinally over the bin floor. Beneath the bins there were two corresponding 36" outstore conveyors driven by a 30 hp motor. Grain could be tripped off the upper belts onto a conveyor running south from "C1" through a overhead gallery to elevators "B" and then "A". It was this horizontal transfer bridge that was immortalized by the camera of architect Walter Gropius as it crossed the T of each flour mill. The exact nature of the arrangements for handling grain transferred to elevators "A" and "B" via this route remains undetermined. Presumably it was tripped off the gallery conveyor and spouted to transverse belts connecting each storage annex with its respective flour mill. In the case of Elevator "A", the conveyor gallery from "C1" was superimposed on the original low cupola of the Johnson-Record tile bins. The exact location and specifications of lofters, scales and conveying machinery in elevators "A" and "B" remains undetermined.

When the Frontier/Washburn Crosby complex eventually acquired its own marine legs, it did so by erecting two particularly significant examples of the type. In 1911 James Stewart & Co. designed and built the first circular reinforced concrete marine tower ever constructed. It rose 167'-2" above low water datum and measured 32' in diameter. Rooted to the dock on the east side of the city ship canal, the tower contained a fixed marine leg with the customary counterweight, winch and pusher arm for regulating its position within the vessel's hold. The leg's endless belt carried a double row of 12" x 8", 8" deep buckets, spaced 12" apart on centers. A 75 hp motor mounted on the crosshead drove the marine leg through reduction gearing, as in the case of the recently completed Kellogg Elevator. A 50 hp motor powered the pusher arm and the hoist winch, as well as the ship shovels, through belt and rope drives. Scoopers in the hold of a vessel engaged and disengaged the ship shovel drums for forward and reverse shovel movement by means of lines running up to friction clutches. The original elevating capacity of the marine leg was 22,000 bu./hr.--about par for the pre-World War I period.

Grain discharged over the head pulley into an upper receiving garner with a capacity ranging from 1,500 to 3,000 bushels depending on the relative position of the marine leg. Below this garner, grain dropped into a 300-bushel Fairbanks hopper scale and thence into an 800-bushel lower distributing garner. A turnhead beneath this second garner diverted grain either onto the ground-level conveyor between wooden Frontier and "C1" or into the boot of the tower loft for re-elevation. The belt on this leg carried a double row of 18" x 8", 8" deep buckets, spaced on 13" centers. A 100 hp motor powered this

lofter through rope drive and spur/pinion reduction gearing; the same power source also drove the 42" wide belt conveyor onto which the tower lofter discharged for transfer through an overhead gallery to the bin floor of Elevator "C1".

When additional storage capacity was constructed in 1913 in the form of Elevator "C2", some of the new bins were linked to the fixed marine tower by another 42" belt and overhead bridge. However, this arrangement was incapable of serving all the bins in "C2" directly. Contemporary published accounts suggest that direct spouting from the marine tower to "C2" was also contemplated; the nature of any such provisions as built or currently existing remains undetermined. When the concrete tower shouldered the load of raising ex-lake grain, the wooden Frontier Elevator was dismantled and its plot used for construction of additional storage.

In 1924 a second significant marine receiving facility was added to the site--a movable tower designed by Monarch Engineering. This may have been the first marine tower in Buffalo featuring individual motor drive rather than indirect power transmission for each function--marine leg, tower mover, counterweight hoist, pusher arm and ship shovels. Potential rivals for this honor are the 1922 marine tower at the American Elevator and the replacement towers at Great Northern, which were both Monarch projects from the same period. The new tower traversed the dock for the rather short distance bracketed to the north by the projecting "C1" workhouse and on the south by the four-story concrete warehouse that Monarch had erected along the City Ship Canal in 1922. Since no storage tanks occupied the area immediately to the rear of the marine tower, there was no need for a tower lofter to re-elevate grain back up to the level of the bin floor for distribution. Instead, after instore weighing in the marine tower's 400-bushel scale, grain was apparently conveyed east a short distance through a structure adjoining the 1922 Monarch warehouse to a new lofter appended to the south facade of "C1".

Unlike the Monarch marine tower, this external leg did use rope-drive transmission between a motor on the bin floor of "C1" and the head pulley. A gallery extended north from this new leg over the existing bin floor cupolas of "C1" and "C2;" trippers on the gallery conveyor diverted grain through articulated turnspouts to the bin floor belts in "C1" and to bin floor belts or bins in "C2".

By the mid-1920s, insofar as marine receiving and internal distribution were concerned, the materials handling flow at Frontier/Washburn Crosby had assumed much of its present configuration. Grain elevated through the 1911 fixed marine tower

was transferred to "C1" by either the ground-level conveyor or the overhead gallery previously described. The former route had presumably required some re-engineering of the connection that had once commenced at the wooden Frontier Elevator. A second bridge from the fixed tower conveyed grain to certain adjacent bins in "C2" that lay within the radius of a turnspout at the terminus of the belt.

The tower gallery was situated above the bin floor cupola of the irregularly-shaped "C2" elevator so further distribution via horizontal conveyors was also possible. A 30 hp motor at 715 rpm drove both the tower gallery belt and a 42" wide conveyor, running basically north-and-south on the west side of the square formed by "C2's" larger bins and connecting the bin floors of "C2" and "C1." Grain was tripped off the 42" belt from the tower down onto the 42" conveyor; this belt in turn supplied the east-west transverse conveyors over the majority of "C2's" storage bins. There were five of these transverse belts, each 42" wide, equipped with two-pulley trippers, and driven from a common shaft by a 25 hp motor at 715 rpm. The 42" conveyor in "C2" ran all the way to the "C1" workhouse, where it could be loaded with grain received through the fixed marine tower but re-elevated at "C1" as previously described. Through its own bin floor conveyors, "C1" continued deliveries to elevators "A" and "B" through the overhead bridge previously described.

For reclaiming grain from storage in this area there were two 36" basement belts in "C1," leading to the workhouse lofters, and five 36" transverse basement belts, leading to the ground-level conveyor connecting "C2" with "C1". The shipping conveyors in "C2" ran through tunnels and were driven by a 30 hp motor at 715 rpm. "C2" contained no internal lofters. Grain requiring re-elevation from storage (to reach "A" and "B", for example) had to be transferred to "C1's" workhouse. The 1924 mobile marine tower routed instore grain only to the new external lofters on the south side of "C1". From the head of this leg the conveyor gallery previously described extended across "C1" and "C2"; it was eventually extended to "C3" as well.

The nature of the machinery layout in Elevator "C3" (1925) remains undetermined, as does the sequence of development with respect to rail receiving. The dominant feature of "C3" is its central house lofters, the housing of which is now emblazoned with the Gold Medal logo. At 205' in height, "C3's" internal leg represents the apex of grain elevator construction in Buffalo. Spouts to surrounding conveyor galleries or bins are visible on various sides of this imposing tower.

The "C3" lofters was at one time the point at which three conveyor galleries converged. The bridge that once connected

Frontier with the Dakota Elevator to the north is no longer extant, as the Dakota was demolished in 1965. A second conveyor represented the extension of the gallery from the 1924 external loft across "C1" and "C2". The third gallery, also external, stemmed from a fourth loft, and was situated on the east side of "C2" near the juncture with "C3". This leg appears to be associated with rail receiving.

A Kar-Flo car dumper was installed on the northwest corner of "C3" in 1958, about the time the St. Lawrence Seaway opened. Grain received at the dumper appears to have been transferred to "C2" and "C1" by ground-level conveyor, the "C2" route presumably entailing further transfer to the "C1" house lofts for elevation to storage. The loft on the east side of "C2" raised grain to the gallery connection with the "C3" leg, presumably for instore weighing and subsequent distribution. The unusual height of "C3's" leg may be explained either by the presence of cleaning machinery, often required in the case of rail receipts, or by a need to facilitate direct spouting to as many bins as possible throughout this sprawling addition.

In terms of the capacities associated with key elevator functions at the General Mills Complex, the asymmetry between receiving and shipping operations noted at the outset is confirmed by comparative figures. Vessel unloading rates remained steady at a nominal level of 50,000 bu./hr. through both legs until the early 1960s, when a decline to 40,000 bu./hr. was noted in published sources. The marine legs may have been upgraded during the late 1960s since the 50,000 bu./hr. level was restored by 1971. The dock remains active with upwards of fifty vessel arrivals per year. During the 1930s a single car pit handled two to three boxcars per hour; the exact location of this equipment in relation to the rail receiving facilities for the "A" and "B" mills remains undetermined. Installation of the car dumper boosted the unloading rate to 3-1/2 to 4 cars per hour, though the advent of hopper cars presumably eliminated activation of the tilting machinery.

By the 1930s the Frontier Elevator was equipped with a single spout for loading out to boats or barges at a rate of 15,000-20,000 bu./hr. However, marine shipments were discontinued in the early 1970s, if not before. Shipments out via rail, nominally conducted at a rate of 20,000 bu./hr. through two loading spouts during the mid-1950s, had also terminated by 1990. The complex now has extensive provisions for receiving and shipping via truck. Incoming vehicles use the former car pit and deliver up to 6,000 bu./hr. Outgoing vehicles are loaded through six spouts at an overall rate of 12,000 bu./hr. The materials handling arrangements at the General Mills site are both intricate and significant, particularly with respect to the

marine towers. However, the complex does not represent the full range of machinery and process flows ordinarily associated with the transfer and storage elevators that were economically and visually prominent parts of Buffalo harbor from the 1840s through the 1950s.

ENDNOTES

1. Erie County Clerk (ECC), Corporations, Frontier Elevator Company, Box 6170, Certificate of Incorporation, June 23, 1886. All Erie County Clerk documents are listed by date of document origin, not by date of filing, unless otherwise noted.
2. ECC. Corporations, Frontier Elevator Company, Box 6170, Certificate of Incorporation, June 23, 1886; Certificate of Affidavit, January 15-February 26, 1887; Buffalo City Directory. 1886, 1887, 1888, 1894.
3. ECC, Corporations, Frontier Elevator, Annual Report: 1888-1898; ECC, Mortgages, Liber 513, November 16, 1888, p. 14; Buffalo and Erie County Public Library (BECPL), Scrapbook, "Harbor," Vol. 1, 360.
4. Buffalo City Hall, Permits and Plans, Building Permit 15705, April 18, 1903; BECPL, Scrapbook, "Harbor," Vol. 1, 334-36, 360; William C. Edgar, The Medal of Gold (Minneapolis: The Bellman Company, 1925), 223.
5. Edgar, Medal of Gold, 218-19; Edward C. Kirkland, Industry Comes of Age (Chicago: Quadrangle Books, 1961), 175; Herman Steen, Flour Milling in America (Minneapolis: T. S. Denison & Company, Inc., 1962), 64, 69.
6. Edgar, Medal of Gold, 218-19; BECPL, Scrapbook, "Harbor," Vol. 1, 313, 335.
7. BECPL, Scrapbook, "Harbor," Vol. 1, 335; Edgar, Medal of Gold, 223; ECC. Corporations, Frontier Elevator, Box 6170, Application, October 2, 1907.
8. Buffalo Express, September 25, 1909, p. 7; Buffalo City Hall, Permits and Plans, Permit 28458, April 1, 1909, and Permit 33568, April 13, 1911. These two permits were for the concrete grain elevator and its marine tower, respectively. The new construction replaced the original Frontier Elevator.
9. Steen, Flour Milling in America, 69; ECC, Corporations, Frontier Elevator, Box 6170, Certificate of Increase of Capital Stock, March 4, 1913; Edgar, Medal of Gold, 218.
10. Steen, Flour Milling in America, 73-77, 272-273; Milton Moskowitz, ed., Everybody's Business: An Almanac (New York: Harper & Row, 1980), 32; Moody's Industrials, 1973, 1990.

11. ECC, Corporations, Frontier Mill & Elevator, Box 6170, Certificate of Dissolution, March 4, 1929; Buffalo City Hall, Permits and Plans, Permit 92476, July 15, 1925 Washburn-Crosby ("Frontier Elevator and Mill"); 20208, May 29, 1928, Washburn-Crosby; 15448, April 16, 1929, Washburn-Crosby.
12. BECPL, Scrapbook, "Industry," Vol. 4, 106; Buffalo City Hall, Permits and Plans, Permit 31334, August 11, 1939, General Mills; 31606, October 26, 1939, General Mills.
13. BECPL, Scrapbook, "Industry," Vol. 9, 4-5; Buffalo City Hall, Permits and Plans, Permit A12148, August 25, 1959, General Mills.
14. BECPL, Scrapbook, "Industry," Vol. 9, 137-38; Moskowitz, Everybody's Business, 32.
15. Moskowitz, Everybody's Business, 32; Dan Morgan, Merchants of Grain (New York: Penguin Books, 1979), 124; Steen, Flour Milling in America, 274-75; Moody's Industrials, 1973, 1990.
16. Steen, Flour Milling in America, 9.273; BECPL, Scrapbook, "Industry," Vol. 9, 2, 104, 133, 137.
17. BECPL, Scrapbook, "Industry," Vol. 10, 23.
18. BECPL, Scrapbook, "Industry," Vol. 10, 197, 199, 200.
19. BECPL, Scrapbook, "Industry," Vol. 10, 263; Buffalo City Hall, Permits and Plans, Permit A43556, General Mills, October 16, 1968; Permit 46632, General Mills, July 24, 1969.
20. Moody's Industrials, 1992.
21. On the overall physical development of the site see the following local history scrapbooks at Buffalo and Erie County Public Library (BECPL): "Buffalo Harbor," Vol. 1, 334-36 (Buffalo Courier, 12 August 1903 and 14 August 1903); "Industry," Vol. 4: 106 (Buffalo Courier-Express, 13 April 1938); "Industry," Vol. 9: 4-6 (Buffalo Evening News, 7 February 1959, p. 133, Buffalo Courier-Express, 9 February 1961, p. 137-8, Buffalo Evening News, 8 March 1961); Vol. 10: 23 (Buffalo Evening News, 15 October 1963, p. 129, Buffalo Evening News, 4 November 1964, p. 197-200, Buffalo Courier-Express, 4 June 1965 and Buffalo Evening News, 4 June 1965); Vol. 11: 56 (Buffalo Evening News, 11 September 1968).
22. On the demolition of the Dakota Elevator, which had been purchased outright in 1937, see BECPL, Local History Scrapbook, "Industry," X: 263 (Buffalo Evening News, 24 November 1965).

SOURCES

Unless otherwise indicated by footnotes, descriptions of machinery and process flows are based on information from the following sources.

Buffalo City Directories, 1886, 1887, 1888, 1894.

Buffalo & Erie County Public Library, scrapbooks, "Harbor," Vol. 1, p. 334-36, 360; "Industry," Vol. 4, p. 106; Vol. 9, pp. 4-5, 137-38; Vol. 10, pp. 23, 197, 199, 200, 263; Vol. 11, p. 56.

Buffalo Express, 25 September 1909, p. 7.

Building Permits and Plans, 301 City Hall

- #15705 (18 April 1903)
- #28060 (23 January 1909)
- #28458 (1 April 1909)
- #33568 (13 April 1911)
- #38640 (4 April 1913)
- #43462 (19 October 1914)
- #9743 (18 April 1916)
- #10078 (5 August 1916)
- #72336 (19 August 1922)
- #87091 (11 September 1924)
- #92476 (15 July 1925)
- #R029134 (4 December 1937)
- #45913 (27 October 1950)
- #78943 (25 August 1959)
- #100017 (29 October 1965)
- #105269 (19 May 1967)
- #113138 (16 October 1968)
- #116356 (24 July 1969)
- #116610 (13 August 1969)

"Circular Concrete Marine Tower at Buffalo," Plans of Grain Elevators, 4th ed. (Chicago: Grain and Feed Journals Consolidated, 1918), 142-143.

Edgar, William C. The Medal of Gold. Minneapolis: The Bellman Company, 1925.

Erie County Clerk, Records, Erie County, NY.

Gold Medal News, (Jan.-Feb 1969): 2-16 in Vertical File-Manufacturers, G at Buffalo & Erie County Historical Society.

Green's Marine Directory of the Great Lakes (title and publication data vary):

30th ed. (1938), 324.
32nd ed. (1940), 301.
34th ed. (1942), 342.
40th ed. (1948), 339.
44th ed. (1952), 339.
48th ed. (1956), 348.
53rd ed. (1961), 326.
57th ed. (1965), 154.

Kirkland, Edward C. Industry Comes of Age. Chicago: Quadrangle Books, 1961.

Moody's Industrials, 1973, 1990, 1992.

Morgan, Dan. Merchants of Grain. New York: Penguin Books, 1979.

Moskowitz, Milton, ed., Everybody's Business: An Almanac. New York: Harper & Row, 1980.

Steen, Herman. Flour Milling in America. Minneapolis: T. S. Denison & Company, Inc., 1962.

U.S. Army Corps of Engineers, Port Series No.41, The Port of Buffalo, New York, revised 1971 (Washington: Government Printing Office, 1972), 43.

U.S. Army Corps of Engineers, Port Series No.41, The Port of Buffalo, New York, revised 1980 (Washington: Government Printing Office, 1980), 48.

U.S. Army Corps of Engineers, Port Series No.41, The Ports of Buffalo, Rochester, Oswego and Ogdensburg, New York, revised 1990 (Washington: Government Printing Office, 1990), 48.

War Department Corps of Engineers, U.S. Army and United States Shipping Board, Transportation on the Great Lakes (Washington: Government Printing Office, 1926), 231.

War Department Corps of Engineers, U.S. Army and United States Shipping Board, Transportation Series #1, Transportation on the Great Lakes (Washington: Government Printing Office, 1930), 228.

War Department, Corps of Engineers, United States Army, Transportation Series #1, Transportation on the Great Lakes (Washington: Government Printing Office, 1937), 247.

APPENDIX

Elevator "B"

Foundation: Wooden piles and concrete foundation slab 2'-2" thick, reinforced with longitudinal lug bars

Basement: Full height (11'); 1/4 above grade, formed of four elongated octagons each supporting two main bins Concrete bin floor supported by transverse basement walling; exterior walls appear as part of elongated polygon

Hoppers: Flat mortar slab on slag concrete supported by bin slab; draw-off at side of bin via several spouts per bin

Bins: Capacity 250,000
Main Bins 4 x 2 in parallel rows, cylindrical 19'-2" in diameter on 20'-4-1/2" centers, 89' high (from bin slab)
Interspace bins 3 x 1
No outerspace bins
Tangential intersections to all bins
Bin wall thickness 8", at intersections 14"
Vertical reinforcement unknown
Horizontal reinforcement rectangular bars graduated in 12" courses; each course band of 3' x 26' lengths with 4' overlaps; the horizontals are located in the center of the wall

Bin Floor: Concrete slab on I-beams; ogee-moulded cornice following bin line at eaves

Gallery: Structural steel with ferro-enclave plastered walls

REFERENCES: The original plans housed in Buffalo City Hall provide much of the above detail. The city building permit provides dates. Construction costs are aggregated with those of "B" Mill and cannot be quantified. "The Development Methods of Raising Slip Forms," Grain Dealers Journal, Special Plans Book, 5 (1942): 10, shows the building under construction.

Elevator "C1"

Cost: \$125,000

Foundation: Wooden piles and concrete foundation slab 2' Transverse lug bars

Basement: Height (9'-8") 1/4 above grade; bin slab (16"), supported by transverse & longitudinal basement walling; exterior walls appear as half hexagons, pierced by small top lights

Hoppers: Mortar slab on slag concrete supported by bin slab; draw-offs spout of conical steel to inner side of each bin

Bins: Capacity 750,000 bushels
Main bins, 6 x 2 in parallel rows, cylindrical 31' in diameter, 107' high (from bin slab)
Interspace bins 5 x 1
No outerspace bins
Tangential intersections between all bins
Bin wall thickness 9", 12" at intersections
Vertical reinforcing: 8 1" jacking rods located at either end of each tangential contact wall; 12 rectangular verticals in groups of 3 spaced equidistantly between jacking rods
Horizontal reinforcement wired to outside of verticals; graduated rectangular bars arranged in 12" courses; single contact anchor at end of every tangential contact wall; contact anchor at every course, bent about vertical; bars located within center of wall

Bin Floor: Concrete supported on transverse I-beams
Alternating transverse and longitudinal reinforcing across adjoining main bins, diagonal grid over interspaces; ogee cornices follow bin line at eaves

Gallery & Workhouse: Structural steel, with ferro-enclave plastered walls

REFERENCES: The surviving plans at Buffalo City Hall provide much of the above detail. City building permits provide dates and City Plans Book for 1909 costs. The American Elevator & Grain Trade 28 (15 December 1909) describes the completed structure.

Elevator "C2"

Cost: \$200,000

Foundation: Wooden piles capped by 2'-2" concrete foundation slab; reinforced by square lug bars arranged transversely

Basement: Height 7'-4", 1/4 above grade; bin slab (16") supported on basement walls; 6 transverse walls located below each main bin, two shared with adjacent bins; walls are not continuous; exterior walls have 5 sides and resemble one-third of a polygon
Lit by small top lights

Hoppers: Mortar slab on slag concrete supported by bin floor; three draw-offs per bin along center line, via conical steel spouts

Bins: Capacity 2,388,100 bushels
Main bins, 5 x 5, large bin 31' in diameter on 32' center; 5 small bins 24' in diameter grouped to NW of building; all cylindrical and in parallel rows, 116'-4" high (from bin slab)
Interspace bins: 4 x 4 between large bins, 3 between small bins
Outerspace bins: 2 about single fifth small main bin; one has concave 1/4 circle outer wall
Tangential intersections between all bins
Bin wall thickness 9", 12" at intersections
Vertical reinforcing unknown
Horizontal reinforcing: located centrally in bin wall; graduated rectangular bars arranged in 12" courses of 3 30' bars with 4' laps

Bin Floor: Concrete (5") on I-beams, ogee cornice following bin line

Gallery: Monolithic concrete, pillar and panel
Marine Tower: Fixed, cylindrical, concrete; 167' high, 8" walls; built by James Stewart, 1912 Structure divided internally both horizontally and vertically

REFERENCES. The original plans at Buffalo City Hall provide much of the above information. The city building permits provide dates and the City Plans Book for 1913 costs of construction. The details of the marine tower are from Grain Dealers Journal, Special Plans Book, 4 (1918): 14.

Elevator "C3"

Cost: \$225,000

Foundation: Wooden piles

Basement: Internally walled type, walls support bin slab Outer walls appear as part of polygon; 1/3 above grade

Bins: Capacity 1,200,000 bushels
Main bins in two wings, one group of 5 x 5 with 3 x 3 group at right angles; bins cylindrical, 22' in diameter; fit into diagonal wall between wings; two wings of 22' bins 1 bin approx. 30' in diameter; 1 bin approx. 17' in diameter and 1 bin approx. 22' in diameter; bin height 117' above bin slab
20 interspace bins
5 outerspace bins; concave 1/4 outer walls accommodated within between irregular bins of diagonal wall
Tangential intersections to all bins
Wall thickness unknown

Gallery &
Workhouse: Monolithic concrete, smooth exterior walling

REFERENCES: The city plans have been lost. Building permits provide the dates and the City Plans Book for 1925 costs. All other details are from a Sanborn Fire Insurance Map.